

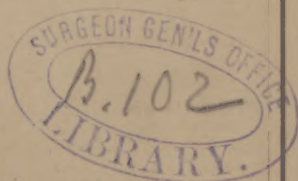
WILDER *of B. G. B. Hunter*
from the author

THE
ANATOMICAL USES
OF
THE CAT.

BY
BURT G. WILDER, M. D., ✓
PROFESSOR OF PHYSIOLOGY, COMPARATIVE ANATOMY, AND ZOOLOGY IN CORNELL
UNIVERSITY, AND OF PHYSIOLOGY IN THE MEDICAL SCHOOL OF MAINE.

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THE ANATOMICAL USES OF THE CAT.



Two years ago * the writer endeavored to point out the extent to which the study of human anatomy may be aided by the previous examination of certain animals, especially *Amphioxus*, the frog, and the cat. The purpose of the present article is to show that not only general facts and ideas, but even an acquaintance with details of structure and methods of work, may be gained by the dissection of the last-named animal.

Some of the most important portions of human physiology have, as a basis, observations and experiments upon animals; and the acceptance of the results as applicable in the main to man involves a recognition of the essential identity of the structure, properties, and functions of our organs with those of animals.

But while physiologists openly acknowledge their indebtedness to dogs and frogs, rabbits and monkeys, their example seems to be lost upon their anatomical colleagues, who—in practice at least—admit that human anatomy can be taught and learned from the human cadaver alone.

To a certain extent this view is doubtless correct. Far be it from me to suggest that doctors should confine their anatomical researches to rats, like the Chinese, or even to monkeys, as has been reported of Galen. Almost equally loth

* In an article entitled "Should Comparative Anatomy be included in a Medical Course?" published in this Journal for October, 1877.

should I be to witness the adoption of a recent proposition that anatomy should be taught by means of models and diagrams, dispensing altogether with actual dissection. But, in view of certain obvious and considerable difficulties which attend the pursuit of practical anatomy upon the human body, it may be worth while to inquire whether a portion of the necessary knowledge may not be gained from the lower animals, and thus serve as a foundation for that which the human subject alone can supply.

Few members of the medical profession now believe that between the bodies of man and the lower animals is fixed a gulf great and impassable; few probably think that the structural differences are commensurate with the unlikeness of form and habit of life; most have doubtless learned that man is certainly a vertebrate and a mammal, and are ready to admit that while as to his spirit he may be "only a little lower than the angels," as to his body he is "only a little higher than the monkey." Nevertheless I apprehend that many physicians are somewhat startled when first they learn, from actual dissection, how slight are the differences between a cat and a man. Not only has the former a head, a neck, a trunk, and two pairs of limbs with similar bones, muscles, and joints, but also the chest, abdomen, and pelvis contain the same organs similarly arranged. The heart inclines a little toward the left, while the liver lies more upon the right; in fact, one is rather surprised than confused to find the left kidney farther from the head instead of the right, as in man. Examine the arm or front leg: here are shoulder-blade and collar-bone, humerus, ulna and radius, carpals, metacarpals, and phalanges. Among the muscles we easily recognize the *latissimus*, *teres major* and *teres minor*, the *supra-* and *infra-spinatus* and *subscapularis*, the *biceps* and *triceps*, the *brachialis* and *supinator longus*. The brain presents all the primary divisions, and some of the fissures of the hemispheres are homologous with those of man. Even the roots, trunks, and principal branches of the perplexing cranial nerves may be easily identified in the cat.

Since, however, with more or less qualification, the same may be said of many other mammals, it is proper to explain

why the cat is selected rather than the dog, rabbit, rat, pig, sheep, or monkey. Were monkeys obtainable at a moderate cost, they would be admirably fitted for preliminary anatomical work, and the student should lose no opportunity for their dissection.* Sheep and pigs are inconveniently large and costly. Rats are as inconveniently small, and are not easy to obtain un mutilated. Dogs vary in size and to some extent in structure, so that strict comparisons with man are difficult. The rabbit is eligible as to size; it is easy to keep and to rear; but its structure, like that of the sheep and pig, much less closely resembles that of man than does that of the cat; there are no cerebral convolutions, or canine teeth; the digestive organs are more strictly herbivorous, and the muscles are less easily homologized with those of man.

Let it not be thought that the idea of making the cat subservient to human anatomy is here claimed as original. Nearly twenty years ago, the late Professor Jeffries Wyman, in commenting upon the unsatisfactory nature of some notes of dissections, said: "Much of this is due to the lack of suitable standards for comparison. The human body is not a suitable standard for the lower vertebrates. The best thing any anatomist can do is to prepare complete accounts of the structure of a few forms, each typical of some large group. The fowl could represent the birds, and the cat the mammals. The cat's anatomy should be done first, because it would also serve as an introduction to human anatomy, and thus become an important aid to medical education."

Now Wyman was not only the highest anatomical authority in America; he was also noted for judicial impartiality, and for caution in the adoption and expression of new ideas. He had been professor of anatomy in a medical school; and, at the time of the conversation above alluded to, was teaching anatomy to medical students. I have been unable to find in his published works any reference to this use of cats, but he may have made the same remark to others, and all his students must share my regret that so few of the wise things said in his laboratory ever found their way into print.

*The same suggestion is made respecting still-born children, which can sometimes be obtained for anatomical purposes.

Let me now state more distinctly the thesis which will be supported in the present article: *Under existing circumstances, the earlier dissections of the human anatomist may be made upon the cat more advantageously than upon the human body. Felotomy should be the stepping-stone to anthropotomy.*

The subject may be naturally considered under the following heads:

A. The scope and requirements of human anatomy.

B. The present conditions of its study.

C. The advantages of using the cat as a subject of dissection.

D. The disadvantages of so doing.

E. Conclusions.

A. *The scope and requirements of human anatomy.*—The study of what may be seen with the unaided eye is called *gross* or *macroscopic* anatomy. *Fine* or *microscopic* anatomy or *histology* is the study of tissues. *Surgical* anatomy concerns chiefly the relative position of parts which are commonly subject to operation; *physiological* anatomy includes the cellular structure of all organs, and the position and nature of the viscera more especially. Each of these kinds of anatomy has its peculiar methods and instruments, and their employment is not materially facilitated by the occupations of ordinary life. The good whittler is not necessarily an expert dissector. Working with the microscope implies something more than shutting one eye and looking through a brass tube. Familiarity with a garden-engine is no assurance of ability to make a "fine injection," and the youth who has helped to make pickles and preserves finds his skill to avail him little for the permanent preparation of a delicate embryo or brain.

An important part of anatomy is the knowledge of the *position* of the *viscera* relatively to each other, and to the surface of the body. This knowledge does not come by nature. Perhaps no one, in thought, has ever located his brains elsewhere than in his head, but most physicians have been appalled at the serious displacements of other vital organs implied in the words or gestures of apparently intelligent patients.

Sooner or later—in fact, the sooner the better—the student must learn for himself, and by actual observation, the *essential characters* of the *tissues*; he must be able, from a fragment invisible to the naked eye, to determine whether it be nerve or muscle, blood of bird or of quadruped. Every skilled observer recalls the time when he mistook air-bubbles for cells of great beauty, adventitious threads for peculiar fibers, and infusoria for ciliated epithelium.

There is a *language* peculiar to anatomy, and it is often too literally “all Greek” to the beginner. Of course the new terms may be committed to memory as arbitrary sounds, but the advantage of associating words with visible and tangible objects has always been so far recognized that the first desire of the embryo anatomist is for a skeleton. Here, however, the “object-teaching” usually halts until he begins to attend lectures, and then new names and new things are presented with a rapidity and lack of connection which would make Froebel’s hair stand on end.

The anatomist usually is, and the doctor always should be, a *teacher*. The scientific article, the public lecture, and the explanation to anxious patients and friends, all require for their fullest usefulness the ability to describe with ease, and to draw correctly at least an outline diagram. He who can not do these things may justly blame the teachers who failed to impress their importance upon him.

Finally, like all other sciences, anatomy demands *absolute accuracy*. The artist and the novelist may be justified in representing the probable—or even the merely possible—in place of the actual; but the anatomist must either limit himself to what he sees, or draw a sharp line between what he knows and what he merely infers. Incompleteness is rarely avoidable, and always excusable—unless completeness is claimed—but falsification is one of the unpardonable sins. The “whole truth” may be unattainable, but nothing more than the truth should be admitted.

B. *The present conditions of the study of human anatomy.*—To begin with, a human subject is *rarely obtainable outside of the medical schools*. Hence, excepting the skeleton, which alone is dreary as a fireless grate, the student is con-

fined to books. This is bad enough for one who intends to enter a medical school, and who desires to fit himself to appreciate the lectures; the case of the unprofessional seeker after anatomical truth is usually still less favorable.

The human subject is inconveniently large. Supposing all difficulties of procuring it to have been surmounted, the student has almost "an elephant on his hands." Handling and transportation are either difficult or expensive, or both; and the very table for dissection, if of the orthodox pattern, is as little adapted to any other purpose as is a coffin or a hearse. The student must stand much of the time, and is thereby partly incapacitated for close observation, for quiet reflection, for careful drawing or description. These desirable operations are further hindered by the proximity of those who, on account of the size and cost of the subject, are usually dissecting at the same time. The amount of offal to be removed is considerable, and its character would hardly justify resort to the expedient practiced with the bodies of dogs used at the laboratory in one of our large cities, viz., tying them to the rear of outgoing freight-trains.

The human subject is *expensive*. This is the natural consequence of the fact stated by Dr. Keen,* that "in this country the supply of subjects never equals the demand." In Vienna a body may be had for fifty cents; but at some country schools it may cost nearly as many dollars. The usual expense—even when divided among several dissectors—is inconveniently large for many students, and especially for the juniors, in consideration of what is learned from a first dissection. Indeed, medicine is unique among all civilized arts in placing the costliest material in the hands of the beginner. What would we doctors think of carpenters and tailors whose journeymen were recommended to learn their trades upon rosewood and cloth of gold?

The human subject is almost always *offensive*. Between death and dissection the interval is rarely less than three days, and may be a fortnight. In the case of a body clandestinely obtained, by the time it reaches the consumer, perhaps in a

* "Sketch of the Early History of Practical Anatomy," 1874, p. 42.

distant city, the stolen fruit is far from sweet. Before the dissection is completed, notwithstanding the use of various preservatives, the subject is commonly a most "unpleasant body."

To conceal the sickening emanations the average student is apt to *smoke*. Indeed, the preparation for the study of medicine seems often to be confined to the establishment of a tolerance of nicotine. This is not the occasion for a discussion of the tobacco question, but there are some aspects of it which the medical student may well consider. In the first place, tobacco smoke merely disguises the odors of putrefaction; it neither destroys them nor prevents their possible bad effects. In the second place, to some of the students, the "remedy may be worse than the disease." Again, to be efficacious, the smoking should be almost continual, consequently excessive, and probably more or less deleterious. Finally, the habit so indulged in the dissecting room is apt to persist after graduation, and the odor from a smoker's clothes may seriously affect women and children when ill, and even prevent the physician's employment in the families of gentlemen who do not use tobacco.*

Whatever may be thought upon this point, it is evident that any knowledge or dexterity acquired before commencing human dissection would enable the student to work more rapidly, and so reduce the time during which the subject must be kept at the risk of putrefaction. Dissection wounds are now so seldom dangerous that it is only necessary to say that their frequency would be diminished by practice upon fresh and innocuous animals.

Lastly, the human subject is rarely available for the study of *viscera*. Usually some of the viscera are diseased. The heart is apt to be full of injection mass. The brain and abdominal viscera decay so rapidly that some of their important

* Upon this practical matter the following remark was made by Rev. Howard Crosby in his address before the graduating class at the Medical Department of the University of the City of New York, February 18, 1879: "A man whose clothes are saturated with stale tobacco is not an agreeable visitor in a sick-room. Nor is it reviving to a delicate organization to have stimulants applied through the physician's breath."

features are soon obliterated; and when, as is customary, their removal is postponed until after the examination of the overlying muscles, their condition is often such as to render them unfit for preservation. How many students have gained a good view of the thoracic duct, or the sympathetic ganglia? How often has it been ascertained whether a subject has two pancreatic ducts or only one? * Is a satisfactory examination of the brain made by the majority of dissectors?

This neglect of the viscera, apparently unavoidable with the human subject under ordinary circumstances, is partly the effect, and partly also the cause, of that predilection for surgery which prevails among medical students. Nine out of ten at some stage of their course cherish aspirations for distinction as brilliant operators; but perhaps an equally large majority are destined to become general practitioners, and would better have given more time to the tissues and the viscera. The students, however, are not altogether responsible for this; judging from the time and space given to the viscera in lecture-courses and text-books, it is doubtful whether the value of physiological anatomy is sufficiently recognized by those to whom students look for guidance and instruction.

C. We are now prepared to consider *the advantages presented by the cat as a subject of preliminary dissection.*

Cats are *abundant* and *cheap*. They may usually be had for the asking, or for a few cents; tender-hearted possessors of superfluous animals have even been ready to pay for their removal, and to the homeless cat a speedy and painless death is a real mercy. Cats may be killed by drowning, or by a few cents' worth of chloroform, or, after partial anaesthesia, by cutting the medulla. Storage and handling are easy, and transportation is rarely required.† Materials for injection, even the finest, cost very little with so small an animal. In short, the poorest student may dissect all the cats he requires.

The *size* of the cat is convenient. Aside from mere ease of handling, and the smallness of the table required, the dis-

* See a paper by S. H. Gage in "The American Quarterly Journal of Microscopical Science," for January, 1879.

† At the time of this writing, a crate of five live cats has just arrived by express from a neighboring town.

sector may usually sit while at work, and thus be more favorably placed for close observation, for reflection, for drawing or describing, and for the examination of books or specimens.

Fresh material may always be had. Cats may be kept alive until needed. Contrary to popular belief, imprisoned cats, if properly fed and cared for, rarely quarrel, and usually seem contented. A dozen individuals of all ages, both sexes, and various social degrees, have lived, eaten, and slept together in quiet and apparent harmony.

There need be *no offensive odors*. By examining the muscles of the chest and abdomen upon one cat, and the viscera upon another, the latter may always be had while fresh; and by using several specimens the muscles need never be allowed to decompose.

The entire cat may be easily and cheaply *preserved in alcohol*. I say alcohol, because it is not only the surest preservative, but the most expensive; hence with cheaper liquids the case is still stronger.

The cost and size of a human subject compel the student to confine himself to a single "part," to dissect more promptly and continually than is sometimes convenient, and often more rapidly than is consistent with entire thoroughness. It may be fairly questioned, however, whether the cost of the unnecessary and perhaps injurious tobacco and alcoholics consumed by some students during their medical course would not enable them to put an entire subject into spirit; it would certainly suffice for the preservation of the head, hands, feet, and certain viscera which require more time than other parts. Now, four litres (about one gallon) of alcohol will fully preserve a cat; and it may often be cheaper to kill the animal at once and put it into spirits than to keep it alive for any considerable time. Once preserved, it may be dissected at any time, and the work may be indefinitely prolonged. The parts are firmer and more easily traced than when fresh; permanent preparations may be made if desired, and there is abundant leisure for drawings and descriptions. Moreover, by the use of alcohol the student is able to dissect the whole of the same individual; he may examine the right side directly after the left, and thus

not only work more rapidly, but also correct his errors and confirm his notes of peculiarities.

From the cat we may always obtain the *tissues* in a normal condition. The difficulty of getting human organs in a perfectly fresh and healthy state has long been admitted practically by histologists. We have now simply to formulate our recognition of the fact, and of its special importance to beginners in microscopic anatomy.

The cat offers especial facilities for the careful study of the *brain* and other *viscera*. This follows from what has been said of the ease with which it may be either obtained fresh or preserved in alcohol. The late Professor Agassiz used to say that alcohol is almost indispensable for the proper investigation of soft parts; and it is to his wise foresight and self-sacrificing efforts that museums and incorporated institutions of learning are authorized to obtain alcohol free of tax for preservative purposes.

Frozen sections of the cat may be made easily, and in all directions, so as to display the relative positions of the vessels and viscera as a preliminary to their examination in the human subject. The sections so made may be preserved as permanent preparations more easily and cheaply than those of the human body.*

D. There are some *disadvantages in using the cat as a subject of a preliminary dissection*.

Some of the organs are *inconveniently small*. Such are the heart and the eye, parts of the brain and urogenital organs. The beginner may do well to first examine these parts from a sheep or ox; but it may be worth while to recall the advice of Cuvier to a young medical student who ventured to tell him that he had discovered something new and remarkable in a human body. Cuvier replied: "Go and anatomize an insect, the largest you can find; then reconsider your observation, and if it still appears to you to be correct I will believe you on your word." After making the dissection the student confessed that he had been in error.

* A series of such sections was shown at the recent meeting of the American Association for the Advancement of Science, in Saratoga.

Some parts of the cat are apparently *more complex* than the corresponding parts of man. For instance, the muscles called *deltoid*, *trapezius*, and *pectoralis major* are single in man, but in the cat each consists of at least three divisions, which differ as to origin, course, insertion, and function. Those who may have adopted the idea that man is not only higher as a whole than animals, but also more complicated as to all his parts, are advised to compare the human brain and stomach with those of a pig, sheep, or porpoise.

Some portions of the cat have not yet been shown to correspond to human structures. This is true of certain cerebral fissures, and of some muscles, especially in the hinder leg. We have simply to await the result of further investigation, but are not debarred from making use of the parts already understood.

The cat is not especially adapted to *experimentation*, as well remarked by Mr. Williams: * "Its strength, agility, and ferocity, when tormented, will serve as checks upon any torture under vivisection which a weaker or more timid animal might be forced to suffer under the knife of the too eager investigator." This I would qualify by saying that the investigator can never be too eager, but he may be too unfeeling or too presumptuous. Nearly all merely illustrative experiments may be performed upon animals rendered unconscious either by anæsthetics or by cutting the medulla. The number of those who are qualified to make demonstrative experiments involving severe or continued pain is very small indeed. Let no feline laboratory be described as Maisons-Alfort has been by Hamerton, "a hell of horses punished for no sin."

There is no manual for the dissection of cats similar to the works on human anatomy, and the "dissectors' guides." This is somewhat strange, considering how easily cats can be obtained and examined. In the "Leçons" of Cuvier, and some other compendiums of comparative anatomy, the organs of the cat are referred to in connection with those of the other felines. Martin's "Das Leben der Hauskatze" treats mainly

* "The Bones, Muscles, and Ligaments of the Cat: Explanatory Index to the Plates."

of habits, and but briefly of structure. Krause's "Monograph" is of the rabbit, and the somewhat too brief directions in the excellent "Practical Physiology" of Foster and Langley refer to the rabbit and the dog. Straus-Durekheim's magnificent "Anatomie du Chat" includes only the bones, ligaments, and muscles; its size and cost—indeed, its very fullness—unfit it for the student who aims at human anatomy as an end; and there is no evidence that the author had in mind the advancement of medical education in the preparation of this, the crowning work of his life. Mr. H. S. Williams has published * the outline plates of Straus-Durekheim, copied and reduced one third by photo-lithography, and in his "Explanatory Index" has given some excellent reasons for the dissection of the cat by medical students; but in its present form the work does not seem to be adapted to the use of the beginner.

So far as pure comparative anatomy is concerned, it is to be hoped that all parts of the cat may be some time described and delineated with the completeness and fidelity with which the motive organs were treated by Straus-Durekheim, and without the errors of nomenclature into which that great anatomist fell. But the present and more urgent need of the young naturalist, the teacher, and the medical student, including veterinarians, is for a manual of feline anatomy and histology, with the following features: It should contain figures and descriptions of the brain and other viscera, both as wholes and as seen in sections and dissections; also of the tissues; of the entire skeleton, and of portions of the muscular, nervous, and vascular systems. To include the whole of these last would impair the practical usefulness of the book for beginners; but, respecting all the parts which are treated, the statements should be precise and based upon the careful comparison of many individuals. Definite knowledge of a few things is better than vague information concerning many. But, above all, it should embrace a clear and complete account of all *methods* of work and manipulation, such as injection, dissection, preservation, preparation, and mounting of organs and tissues; also directions for the performance of the simpler

* G. P. Putnam's Sons, New York.

physiological experiments. Its size and cost should be moderate.

Yet, even in the absence of such a special manual as is here described, the earnest student is far from being helpless in his examination of the cat; his "Gray" or "Quain" will enable him to identify all the viscera and bones, and many of the muscles, vessels, and nerves. At the very least he will learn how to work in that best of schools—personal experience.

E. Conclusions.—I have now presented in detail the arguments at my command in favor of commencing the study of human anatomy with the dissection of cats. So confident am I of the efficacy of the plan that I believe the time to be not far distant when the opportunity for such dissection shall be given in all colleges as a basis for physiological instruction, and when, among the slowly but steadily multiplying requirements for admission to medical schools, shall be the presentation of evidence that the candidate is a good practical anatomist; that he has dissected cats or other animals to such an extent as to render him competent to examine, and qualified to appreciate, the organization of man.

This naturally suggests the general question of preliminary medical education, upon which I had the opportunity of saying something two years ago. The intervening time has only strengthened my belief that, as a rule, nothing should be taught in a medical school which can be equally well learned outside. If students could enter upon the study of medicine with a practical knowledge of anatomy, botany, chemistry, physics, and physiology, how great would be the gain to them and to the public! The time now spent—nay, partly wasted—in presenting facts and principles which should form part of a liberal general education, could then be devoted to the exposition of more strictly medical and surgical branches.

Should the suggestions embodied in this article be adopted, one—perhaps both—of two results might be expected. If the previous thorough dissection of cats should enable students to dispense with some of their human material, there would be less of the necessity which seems to exist in some illiberal regions of our country for the procurement of this material in illegitimate ways. Instead, then, of horrified protests against

“body-snatching,” students would receive the thanks of the community for reducing the number of inharmonious performers of “Nocturnes” and “Lieder ohne Worte.”

If, on the other hand, through a change in public sentiment, and corresponding legislation, all existing obstacles should be removed, so that an equal or greater number of human bodies should be dissected than at present, then all preliminary work upon cats would enable students to learn more easily and retain more surely the facts which form the basis not only of medicine and surgery, but also of physiology, hygiene, and psychology. In either case, not alone the profession, but the public, would reap a substantial benefit from the anatomical employment of the cat.

HEALTH,

AND

HOW TO PROMOTE IT.

BY
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AMERICAN MEDICAL ASSOCIATION; PRESIDENT OF BALTIMORE ACADEMY OF MEDICINE.

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